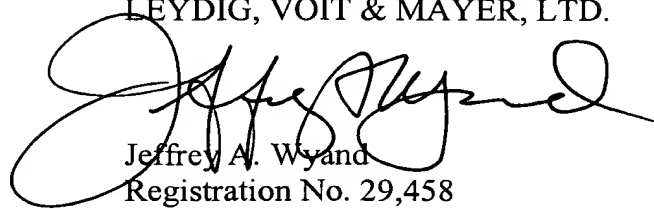


**REMARKS**

The foregoing Amendment correct translation errors and conform the application to U.S. requirements.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

PARK et al.

Art Unit: Unassigned

Application No.: Unassigned

Examiner: Unassigned

Filed: April 12, 2001

For: APPARATUS AND  
METHOD FOR  
DIGITAL  
MULTIPLICATION  
USING REDUNDANT  
BINARY  
ARITHMETIC

SPECIFICATION, CLAIMS AND  
ABSTRACT AS PRELIMINARILY AMENDED

Amendments to the paragraph beginning at page 1, line 16:

Q1 In a multiplication arithmetic algorithm used in conventional multipliers, partial products are obtained using a modified booth's algorithm (MBA) and are added ~~up~~ by a carry-save adder having a structure such as a Wallace-tree, to thereby obtain a final multiplication result. This multiplication is usually achieved using ~~a~~ normal binary arithmetic. Here, the partial products can be summed ~~up~~ using a redundant binary arithmetic technique instead of ~~a~~ normal binary arithmetic technique. The characteristic of ~~a~~ redundant binary arithmetic is that there is no continuous propagation of carry ~~is the property of an adder as~~ required by ~~a~~ general arithmetic for summing ~~up~~ partial products.

Amendments to existing claims:

Q2 1. A digital multiplication apparatus adopting ~~a~~ redundant binary arithmetic for multiplying ~~two numbers~~ a number X and by an m-bit number Y to produce a product, using a radix-2k number system, the apparatus comprising:

a data converter for data-converting the m-bit number Y into m/k-digit data D  
(=  $D_{m/k-1} D_{m/k-2} \dots D_i \dots D_1 D_0$ );

a partial product calculator for converting each of the digits  $D_i$  of the ~~number~~  
~~Y~~ m/k-digit data D converted by the data converter into a combination of the coefficients  
of a fundamental multiple, multiplying the combination by the number X, ~~and outputting~~  
~~the product as a~~ to produce redundant binary partial product products;

a redundant binary adder for summing the redundant binary partial products for ~~all~~  
~~each of the digits of the converted number Y~~ m/k-digit data D to produce a redundant  
binary sum; and

a redundant binary (RB)-normal binary (NB) converter for converting the  
redundant binary sum into a normal binary number and outputting the ~~converted~~  
normal binary sum as the product of the two numbers X and Y.

8. A digital multiplication method adopting ~~a~~ redundant binary arithmetic for multiplying  
~~two numbers~~ a number X and by an m-bit number Y to produce a product, using a radix-  
2k number system, the method comprising:

(a) data-converting the m-bit number Y into m/k-digit data D (=  $D_{m/k-1} D_{m/k-2} \dots D_i$   
 $\dots D_1 D_0$ );

(b) converting each of the digits  $D_i$  of the ~~number Y~~ m/k-digit data D into a  
combination of the coefficients of a fundamental multiple, and multiplying the  
combination by the number X to obtain ~~a~~ redundant binary partial product products;

(c) summing the redundant binary partial products for ~~all~~ each of the digits of the  
~~number Y converted~~ m/k-digit data D to produce a redundant binary sum; and

(d) converting the redundant binary sum into a ~~normal~~ binary number to obtain the  
product of the two numbers X and Y.

Amendments to the abstract:

#### Abstract of the Disclosure

A digital multiplication apparatus and method adopting ~~a~~ redundant binary  
arithmetic is provided. In this digital multiplication apparatus, when two numbers X and

af  
Y are multiplied using a radix-2k number system, a data converter data-converts the m-bit number Y into m/k-digit data D ( $= D_{m/k-1} D_{m/k-2} \dots D_i \dots D_1 D_0$ ). A partial product calculator converts each of the digits  $D_i$  of the number Y converted by the data converter into a combination of the coefficients of a fundamental multiple, multiplies the combination by the number X, and outputs the product as a redundant binary partial product. A redundant binary adder sums the partial products for all of the digits of the converted number Y. A redundant binary (RB)-normal binary (NB) converter converts the redundant binary sum into a normal binary number and outputs the converted normal binary sum as the product of the two numbers. Therefore, even when the radix extends, the burden upon hardware can be minimized. Also, many systems having multipliers serving as important components can be more simply constructed.

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